

# MPEG Clock Generator with VCXO

## Features

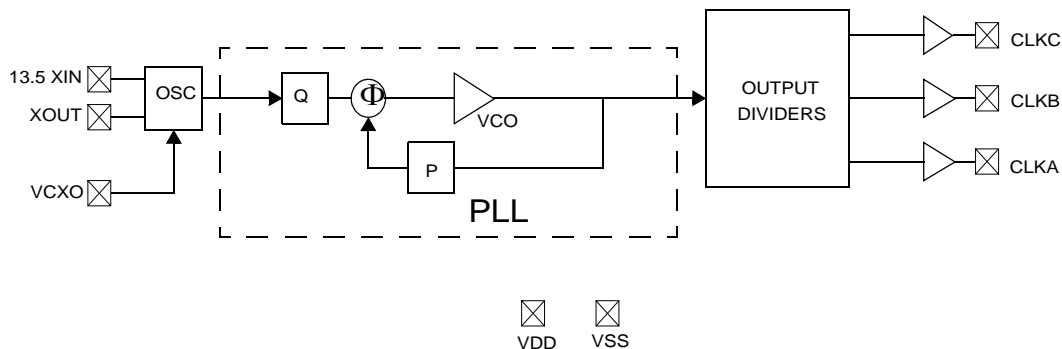
- Integrated phase-locked loop (PLL)
- Low-jitter, high-accuracy outputs
- VCXO with analog adjust
- 3.3V operation
- 8-pin SOIC package

## Benefits

- Highest-performance PLL tailored for multimedia applications
- Meets critical timing requirements in complex system designs
- Large  $\pm 150$ -ppm range, better linearity
- Enables application compatibility

Part Number	Outputs	Input Frequency Range	Output Frequencies	VCXO Profile
CY2412-1	3	13.5-MHz pullable crystal input per Cypress specification	Two 27 MHz outputs, one 54 MHz (3.3V)	Linear
CY2412-3	3	13.5-MHz pullable crystal input per Cypress specification	27 MHz, 13.5 MHz, 54 MHz (3.3V)	Linear

## Logic Block Diagram



## Pin Configuration

Figure 1. CY2412, 8-Pin SOIC

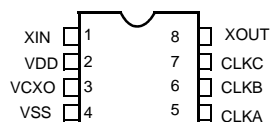


Table 1. Pin Definition - CY2412, 8-Pin SOIC

Pin Name	Pin Number	Pin Description
X <sub>IN</sub>	1	Reference Crystal Input
V <sub>DD</sub>	2	Voltage Supply
VCXO	3	Input Analog Control for VCXO
V <sub>SS</sub>	4	Ground
CLKA	5	54-MHz clock output
CLKB	6	13.5-MHz clock output
CLKC	7	27-MHz clock output
X <sub>OUT</sub> <sup>[2]</sup>	8	Reference Crystal Output

## Pullable Crystal Specifications<sup>[1]</sup>

Parameter	Description	Condition	Min	Typ.	Max	Unit
F <sub>NOM</sub>	Nominal crystal frequency	Parallel resonance, fundamental mode, AT cut	–	13.5	–	MHz
C <sub>LNOM</sub>	Nominal load capacitance		–	14	–	pF
R <sub>1</sub>	Equivalent series resistance (ESR)	Fundamental mode	–	–	25	Ω
R <sub>3</sub> /R <sub>1</sub>	Ratio of third overtone mode ESR to fundamental mode ESR	Ratio used because typical R <sub>1</sub> values are much less than the maximum spec.	3	–	–	
DL	Crystal drive level	No external series resistor assumed	–	0.5	2.0	mW
F <sub>3SEPHI</sub>	Third overtone separation from 3*F <sub>NOM</sub>	High side	300	–	–	ppm
F <sub>3SEPLO</sub>	Third overtone separation from 3*F <sub>NOM</sub>	Low side	–	–	–150	ppm
C <sub>0</sub>	Crystal shunt capacitance		–	–	7	pF
C <sub>0</sub> /C <sub>1</sub>	Ratio of shunt to motional capacitance		180	–	250	
C <sub>1</sub>	Crystal motional capacitance		14.4	18	21.6	pF

## Absolute Maximum Conditions

Parameter	Description	Min	Max	Unit
V <sub>DD</sub>	Supply Voltage	–0.5	7.0	V
T <sub>S</sub>	Storage Temperature <sup>[3]</sup>	–65	125	°C
T <sub>J</sub>	Junction Temperature	–	125	°C
	Digital Inputs	V <sub>SS</sub> – 0.3	V <sub>DD</sub> + 0.3	V
	Digital Outputs referred to V <sub>DD</sub>	V <sub>SS</sub> – 0.3	V <sub>DD</sub> + 0.3	V
	Electrostatic Discharge	2		kV

## Recommended Operating Conditions

Parameter	Description	Min	Typ.	Max	Unit
V <sub>DD</sub>	Operating Voltage	3.14	3.3	3.47	V
T <sub>A</sub>	Ambient Temperature	0		70	°C
C <sub>LOAD</sub>	Max. Load Capacitance			15	pF
f <sub>REF</sub>	Reference Frequency		13.5		MHz
t <sub>PU</sub>	Power up time for all VDDs to reach minimum specified voltage (power ramps must be monotonic)	0.05		500	ms

## DC Electrical Characteristics

Parameter	Description	Test Conditions	Min	Typ.	Max	Unit
I <sub>OH</sub>	Output High Current	V <sub>OH</sub> = V <sub>DD</sub> – 0.5, V <sub>DD</sub> = 3.3V	12	24		mA
I <sub>OL</sub>	Output Low Current	V <sub>OL</sub> = 0.5, V <sub>DD</sub> = 3.3V	12	24		mA
C <sub>IN</sub>	Input Capacitance				7	pF
I <sub>IZ</sub>	Input Leakage Current			5		μA

### Notes

- Crystals that meet this specification includes: Ecliptek ECX-5788-13.500M, Siward XTL001050A-13.5-14-400, Raltron A-13.500-14-CL, PDI HA13500XFSA14XC.
- Float X<sub>OUT</sub> if X<sub>IN</sub> is externally driven.
- Rated for ten years.

## DC Electrical Characteristics (continued)

Parameter	Description	Test Conditions	Min	Typ.	Max	Unit
$f_{\Delta XO}$	VCXO pullability range		$\pm 150$			ppm
$V_{VCXO}$	VCXO input range		0		$V_{DD}$	V
$f_{VBW}$	VCXO input bandwidth			DC to 200		kHz
$I_{DD}$	Supply Current	Sum of Core and Output Current			35	mA

## AC Electrical Characteristics

Parameter <sup>[4]</sup>	Description	Test Conditions	Min	Typ.	Max	Unit
DC	Output Duty Cycle	Duty Cycle is defined in Figure 2, 50% of $V_{DD}$	45	50	55	%
ER	Rising Edge Rate	Clock Edge Rate, Measured from 20% to 80% of $V_{DD}$ , $C_{LOAD} = 15$ pF. See Figure 3.	0.8	1.4		V/ns
EF	Falling Edge Rate	Output Clock Edge Rate, Measured from 80% to 20% of $V_{DD}$ , $C_{LOAD} = 15$ pF. See Figure 3.	0.8	1.4		V/ns
$t_j$	Clock Jitter	Peak to Peak period jitter		100	200	ps
$t_{10}$	PLL Lock Time				3	ms

Figure 2. Duty Cycle Definition;  $DC = t_2/t_1$

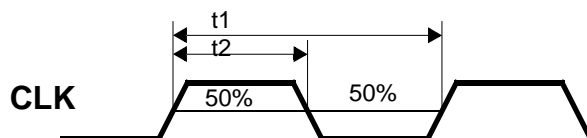


Figure 3. Rise and Fall Time Definitions:  $ER = 0.6 \times V_{DD} / t_3$ ,  $EF = 0.6 \times V_{DD} / t_4$

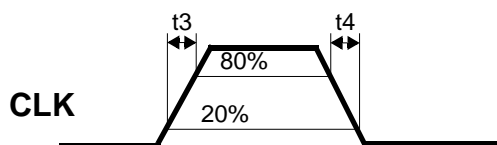
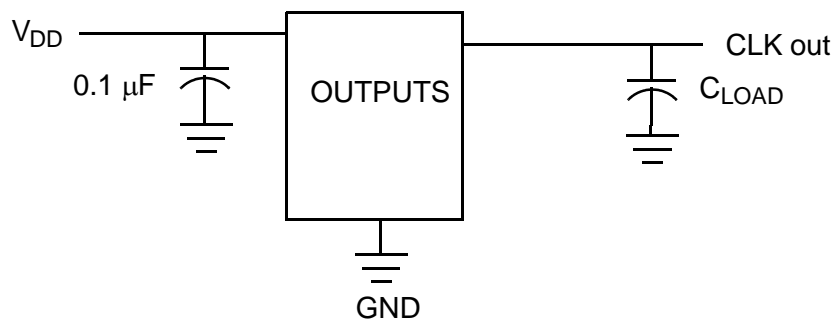


Figure 4. Test Circuit



### Notes

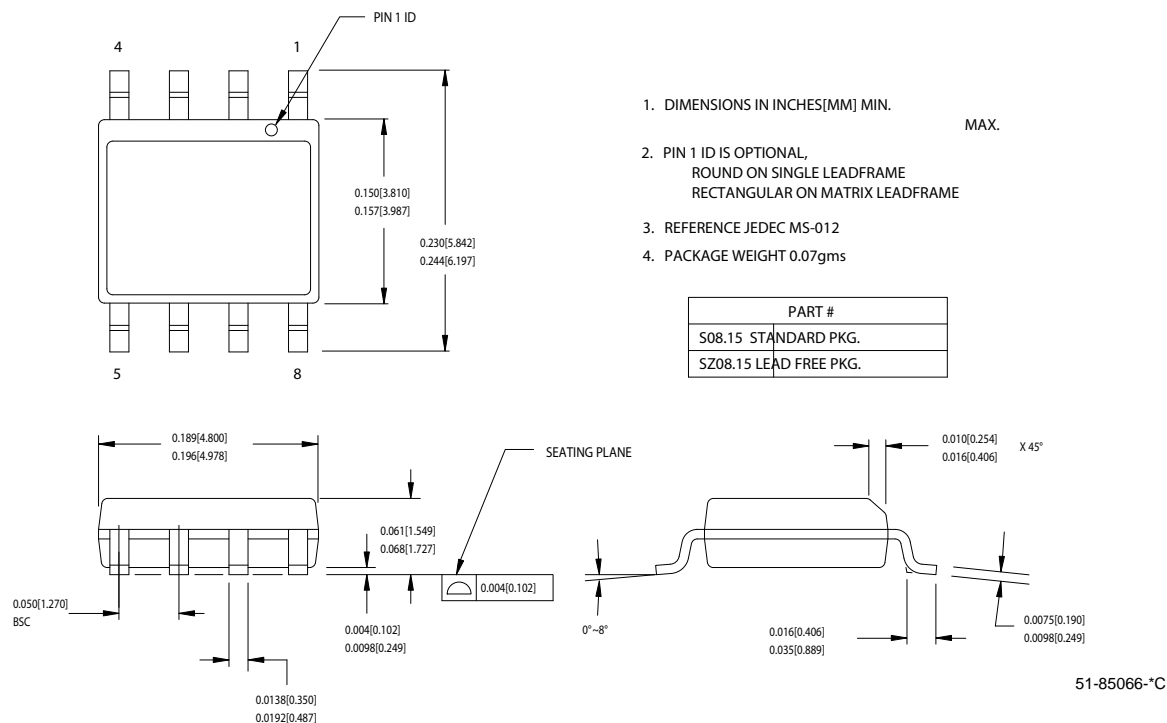
4. Not 100% tested.

## Ordering Information

Ordering Code	Package Type	Operating Range	Operating Voltage
CY2412SC-1 <sup>[5]</sup>	8-pin SOIC	Commercial	3.3V
CY2412SC-1T <sup>[5]</sup>	8-pin SOIC–Tape and Reel	Commercial	3.3V
CY2412SC-3 <sup>[5]</sup>	8-pin SOIC	Commercial	3.3V
CY2412SC-3T <sup>[5]</sup>	8-pin SOIC–Tape and Reel	Commercial	3.3V
<b>Pb-Free</b>			
CY2412SXC-1 <sup>[5]</sup>	8-pin SOIC	Commercial	3.3V
CY2412SXC-1T <sup>[5]</sup>	8-pin SOIC–Tape and Reel	Commercial	3.3V
CY2412SXC-3 <sup>[5]</sup>	8-pin SOIC	Commercial	3.3V
CY2412SXC-3T <sup>[5]</sup>	8-pin SOIC–Tape and Reel	Commercial	3.3V
CY2412KSXC-1	8-pin SOIC	Commercial	3.3V
CY2412KSXC-1T	8-pin SOIC–Tape and Reel	Commercial	3.3V

## Package Diagram

**Figure 5. 8-Lead (150-Mil) SOIC S8**



### Note

- Not recommended for new designs.

## Document History Page

Document Title: CY2412 MPEG Clock Generator with VCXO Document Number: 38-07227				
REV.	ECN	Orig. of Change	Submission Date	Description of Change
**	110492	SZV	10/28/01	Change from Spec number: 38-00898 to 38-07227
*A	112457	CKN	03/14/02	Added CY2412-2 to data sheet
*B	116961	CKN	08/06/02	Removed CY2412-2 from the datasheet. Added CY2412-3 to data sheet
*C	121879	RBI	12/14/02	Power up requirements added to Operating Conditions Information
*D	299735	RGL	02/15/05	Added lead-free for CY2412-1 and CY2412-3 devices
*E	2440866	AESA	04/25/08	Updated template. Added Note "Not recommended for new designs." Added part number CY2412KSXC-1, and CY2412KSXC-1T in ordering information table. Replaced Lead-Free with Pb-Free.
*F	2512734	AESA	06/05/08	Added border to Logic Block Diagram. Added Sales, Solutions, and Legal Information.

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